

REMARKS

Claims 41-45 have been added herein. Claims 1-9, 14 and 31-45 are currently pending.

The following remarks are responsive to the Final Office action and Advisory action dated January 20, 2004 and April 30, 2004, respectively. Applicants note that portions of the following remarks were previously submitted in Applicants' Amendment C After Final filed May 20, 2004 and are being resubmitted since Amendment C was not entered.

Objection to the Drawings

The objections to the drawings are overcome by the amendment of Figs. 1 and 2 described above. In addition, Applicants submit a full set of formal drawings to replace the drawings now on file.

Amendment to the Specification

The specification has been amended to include reference numbers for the columns, wire screen (both are shown in Fig.1) and rebar-type elements (shown in Fig. 2).

General Considerations

This invention relates generally to mine doors and more particularly to mine door leafs for relatively large mine doors. A mine door leaf of the present invention has a central core of a solidified composition and outer panels on opposite faces of the core. The core has a force-transmitting relationship with the panels resulting in an integrated stress-resistant structure. As a result, the mine door leaf is relatively lightweight for its size and is resistant to stresses of the type encountered in a mine environment.

Rejection of Claims

Claim 1

Claim 1 is directed to **a mine door leaf mounted in a mine passage** and comprising:

- a) a central core of a solidified composition,
- b) outer panels on opposite faces of the core,
- c) the core having a force-transmitting relationship with the panels constituting the panels and core as an integral stress-resistant structure resistant to stresses **to which the door leaf is subjected in a mine**, including torsion-induced stresses, shear and bending stresses, and stresses induced by its own weight, and
- d) one or more hinge components on the leaf.

Claim 1 stands rejected as obvious in view of U.S. Patent No. Re 36,853 (Kennedy '853) and U.S. Patent No. 6,481,179 (Zen).

Kennedy '853 discloses in Fig. 1 a mine door system having a door frame, a mine door hingedly mounted on the door frame, and a column contractible heightwise without loss of structural integrity to accommodate a convergence of the ceiling or floor of the passageway without any substantial deformation of the door frame. As mentioned by the Examiner, Kennedy '853 fails to disclose a mine door comprising outer panels and a central core of a solidified composition. Moreover, Kennedy fails to suggest such a door.

Zen discloses in Figs. 1 and 2 a frame 2 for a steel clad door comprising a pair of jamb members 5, a header 6 and a sill 7 molded from a composite material. Each of the frame members 5, 6, 7 is channel shaped having a bottom wall 8, 17, 18 and two sidewalls 9, 19, 20. In addition, the jambs have reinforcing diagonal members 12 extending between their sidewalls 9 and longitudinal grooves 21 in the exterior face of the bottom walls 8 for receiving inturned edges 22 of steel cladding panels 3

thereby attaching the panels 3 to the frame 2. Once the panels 3 are mated with the frame 2, the interior can be filled with insulation 4, such as polyurethane. Zen does not teach or suggest that a foam-filled door would be strong enough for use in a mine, nor does Zen teach that the insulation strengthens the door. Zen relies on the frame to strengthen the door.

Applicants' mine door, as defined by claim 1, is designed to be both strong and lightweight. Strength is needed so that the mine door can withstand the substantial air pressure forces exerted on a door in a mine. For example, the ventilating air in a mine creates substantial air pressure differentials across a closed door, one side of the door being at a relatively higher pressure and the other side at a relatively lower pressure. This differential creates substantial stresses in the door. Also, a mine door is subjected to concussive air forces resulting from intentional or unintentional roof collapses and explosions in the mine during the mining process. Concussion is not simply a single pressure from an expansion of gases or the movement of rock. As an explosion occurs at the mine face, for instance, the pressure is raised locally by the expansion of the explosive gases. Initially there is a shock wave caused by movement of air away from the site of the explosion. This movement creates a vacuum at the site of the explosion, which eventually causes the air to reverse direction toward the center of the explosion. This expansion and contraction of the air repeats in decaying cycles and subjects a mine door to repetitive push and pull forces. If the door is not resistant to such forces, it will fail.

In addition, mine doors are typically mounted in cantilevered fashion, leaving each door leaf unsupported along its free vertical edge (except where it contacts the lintel of the doorway frame) and along its lower edge (except where it is attached to the doorway frame), as shown in Fig. 10 of the

pending application, for example. As a result, a mine door leaf is subjected to torsional forces and is prone to flex if not rigidly constructed. Flexing must be avoided, since this can lead to failure of the door, or at least deformation at the unsupported side of the door sufficient to cause substantial leakage past the door. Such leakage can have adverse consequences in terms of increased costs and ventilation problems. Structural strength and rigidity is also important so that the door can withstand the substantial forces required to open and close the door due to the air pressure differentials discussed above, and further to withstand the substantial abuse a door takes in a mine from passing equipment and personnel.

A lightweight door is also important for several reasons. First, a heavy door includes extra materials and therefore is more expensive. Second, a heavy door has more inertia than a lighter door, thus requiring greater opening and closing forces. In addition, heavy doors are harder to stop when moving, which can create risks to people and equipment around the door. Thirdly, a heavy door is more difficult to transport, handle and install. Applicants' door is strong, lightweight and suitable for use in a mine.

Zen, on the other hand, discloses a conventional steel clad door having an insulating material as its core. As mentioned above, Zen does not disclose or suggest using the insulating material for any purpose but to insulate the door. Accordingly, **Zen fails to show or teach a mine door having panels and core that combine to form an integral stress-resistant structure resistant to stresses to which the door leaf is subjected in a mine, including torsion-induced stresses, shear and bending stresses, and stresses induced by its own weight.** As a result, one of ordinary skill in the art would have no suggestion or motivation to combine the teachings of Kennedy '853 with Zen in developing the claimed invention.

In order to establish a prima facie case of obviousness based on a combination of prior art references, an examiner must set forth some suggestion or motivation to combine the teachings of the prior art references, either in the references themselves or in the knowledge generally available to one of ordinary skill in the art at the time of the invention.¹ This requirement is justified because virtually all inventions are combinations of old elements.² Thus, if identification of each claimed element in the prior art were sufficient to negate patentability, very few patents would ever issue.³ Since there is no suggestion or motivation to combine Kennedy '853 with Zen, a prima facie case of obviousness based on a combination of Kennedy '853 and Zen has not been established. Thus, claim 1 is submitted as non-obvious and patentable over the references of record including Kennedy '853 and Zen.

Claims 2-9, 14 and 31-37 depend from claim 1 and are believed to be allowable for the same reasons as claim 1.

Claims 2 and 33 recite a mine door leaf wherein the force-transmitting relationship is established by adhesion and mechanical coupling or by mechanical coupling of the core to the panels. Similarly, claims 7 and 36 recite a mine door leaf wherein the force-transmitting relationship is established by adhesion and mechanical coupling or by mechanical coupling of the filling to the door panels. Zen also does not teach a door leaf where a force-transmitting relationship is established by mechanical coupling of the core (or filling) to the panels. In Zen, the panels 3 have inturned edges 22 which are secured to grooves 21 in the bottom wall 8 of the jamb members 5. No mechanical devices are used to secure the insulation 4 to the

¹ MPEP § 706.02(j).

² Environmental Designs, Ltd. v. Union Oil Co., 713 F.2d 693, 698, 219 U.S.P.Q. 865 (Fed. Cir. 1983), cert. denied 464 U.S. 1043.

³ Id.

panels 3 probably because its purpose is to provide insulation and not strength to the door. As a result, the references fail to teach each and every element of Applicants' claimed invention. Accordingly, claims 2, 7, 33 and 36 are patentable for these additional reasons.

Claims 34 and 37 recite that the mine door leaf further comprises a mechanical coupling device for mechanical coupling of the core (or filling) to the panels. The mechanical coupling device comprises at least one of wire screen and rebar-type elements. As mentioned above, Zen does not teach or suggest mechanical coupling of the core (or filling) to the panels. Therefore, Zen cannot teach or suggest the use of either wire screen or rebar-type elements. Accordingly, claims 34 and 37 are patentable for these additional reasons.

Claims 38-40 are directed to a mine door installation including a door leaf of generally laminar construction. To the extent claims 38-40 include the same recitations as claims 1, 33 and 34, respectively, the claims are patentable for the same reasons discussed above with respect to claims 1, 33 and 34.

Claim 41

New claim 41 is directed to a mine door installation comprising:

A mine door installation in a mine passageway of a mine, comprising:

- a) a doorway frame in said mine passage, and
- b) a door mounted on said doorway frame for swinging between open and closed positions,
- c) said door including at least one door leaf, said door leaf comprising a central core of a solidified composition and outer panels on opposite faces of the core,

d) said door leaf having at least four edges, said frame directly supporting two of the edges when said door is in said closed position, another two of the edges being substantially free of direct support.

Claim 41 sets forth a mine door installation suitable for forces exerted on a door in a mine, such as the forces described in more detail above. One exemplary embodiment of the claimed invention is shown in Fig. 1 of the present application. As illustrated, each of the door leafs 5L, 5R is mounted in the door frame 3 using hinge component 27, 29 for swinging between closed and open positions. In addition, each of the door leafs 5L, 5R is supported in its closed position by engagement with the frame 3 of the doorway. As a result, the door is substantially unsupported along its free vertical edge and along its lower edge. Supports along the free vertical edge and the lower edge of the door leaf are commonly undesirable in a mine since they restrict passage through the doorway and are susceptible to damage from mining equipment passing through the doorway. Applicants' claimed mine door leaf is mounted in this cantilevered fashion, yet is strong enough to withstand use in a mine.

Claim 41 and the claims depending therefrom (claims 42-45) are submitted as patentable over the references of record including Kennedy '853 and Zen.

CONCLUSION

In view of the foregoing, allowance of the application is respectfully requested. The undersigned requests a telephone call from the Examiner if this would expedite allowance of the application.

The Commissioner is hereby authorized to charge any fee deficiency or credit any overpayment to Deposit Account No. 19-1345 in the name of Senniger, Powers, Leavitt & Roedel.

Respectfully submitted,



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